

CLAIMS

WHAT IS CLAIMED IS:

1. A device for engaging tissue, comprising:
  - a generally annular-shaped body defining a plane and
  - 5 disposed about a central axis extending substantially normal to the plane, the body being movable from a substantially planar configuration lying generally in the plane towards a transverse configuration extending out of the plane, the body comprising a plurality of looped elements comprising alternating first and
  - 10 second curved regions, the first curved regions defining an inner periphery of the body and the second curved regions defining an outer periphery of the body in the planar configuration, wherein the plurality of tines comprise:
    - a first primary tine having a first length; and
    - 15 a second primary tine having a second length, the first and second primary tines being disposed on opposing first curved regions and oriented towards one another in the planar configuration, the first and second lengths causing the first and second primary tines to at least partially overlap one another in
    - 20 the planar orientation.

2. The device of claim 1, wherein the plurality of tines further comprise one or more secondary tines having lengths substantially shorter than the first and second lengths.

5 3. The device of claim 2, wherein the one or more secondary tines comprise tines disposed on either side of each of the first and second primary tines.

4. The device of claim 1, wherein the first and second  
10 lengths are substantially equal to one another.

5. A device for engaging tissue, comprising:

a generally annular-shaped body defining a plane and disposed about a central axis extending substantially normal to  
15 the plane, the body being movable from a substantially planar configuration lying generally in the plane towards a transverse configuration extending out of the plane;

a first primary tine having a first length and extending from the annular-shaped body generally towards the central axis  
20 in the planar configuration and being deflectable out of the plane when the body is moved towards the transverse configuration; and

a second primary tine having a second length and extending from the annular-shaped body towards the first primary tine when the body is disposed in the planar configuration, and being deflectable out of the plane when the body is moved towards the transverse configuration, the first and second lengths causing the first and second primary tines to at least partially overlap in the planar configuration.

6. The device of claim 5, wherein the body is biased towards the planar configuration for biasing the primary tines generally towards the central axis.

7. The device of claim 5, further comprising:  
a set of secondary tines having lengths shorter than the first and second lengths, the secondary tines extending from the annular-shaped body generally towards the central axis in the planar configuration and being deflectable out of the plane when the body is moved towards the transverse configuration.

8. The device of claim 5, wherein the first primary tine, the second primary tine, and the body are formed from a single sheet of material.

9. The device of claim 8, wherein the sheet of material comprises a superelastic alloy.

10. The device of claim 5, wherein the body comprises a plurality of looped elements disposed around a periphery of the body.

11. The device of claim 10, wherein the looped elements generally define an endless zigzag pattern extending about the central axis.

12. The device of claim 10, wherein the first primary tine and the second primary tine extend from looped elements disposed opposite one another.

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13. The device of claim 12, further comprising a set of secondary tines having lengths shorter than the first and second lengths, the secondary tines extending from the annular-shaped body generally towards the central axis in the planar configuration and being deflectable out of the plane when the body is moved towards the transverse configuration, each pair of adjacent tines having an inner curved region disposed therebetween.

14. The device of claim 13, wherein a secondary tine is disposed on either side of the first primary tine, and a secondary tine is disposed on either side of the second primary  
5 tine.

15. The device of claim 10, wherein the plurality of looped elements are expandable between expanded and compressed states for increasing and reducing, respectively, a periphery of the  
10 body in the transverse orientation.

16. The device of claim 15, wherein the plurality of looped elements are biased towards the compressed state.

15 17. A device for engaging tissue, comprising:  
a generally annular-shaped body defining a plane and disposed about a central axis extending substantially normal to the plane, the body being movable from a substantially planar configuration lying generally in the plane towards a transverse  
20 configuration extending out of the plane, the body comprising a plurality of looped elements extending about a periphery of the body;

a plurality of tines extending from the looped elements towards the central axis in the planar configuration, and generally parallel to the central axis in the transverse configuration, the tines comprising tips having a predetermined  
5 spacing from one another in a relaxed state; and

a spring element disposed between adjacent tines between the looped elements and tips of the tines, the spring element resiliently allowing the tips of the tines to be moved away from one another.  
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18. The device of claim 17, wherein the spring element is biased to move the tips of the tines towards the relaxed state.

19. The device of claim 17, wherein the looped elements  
15 comprise a series of outer curved regions connected to one another, thereby defining an endless pattern extending about the periphery of the body in the planar configuration, the tines extending from connection regions of adjacent curved regions.

20. A device for engaging tissue, comprising:  
a generally annular-shaped body defining a plane and disposed about a central axis extending substantially normal to the plane, the body being movable from a substantially planar  
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configuration lying generally in the plane towards a transverse configuration extending out of the plane, the body comprising a plurality of curved elements defining an outer periphery of the body; and

5 a plurality of arcuate tines extending from the curved elements towards the central axis in the planar configuration, and generally parallel to the central axis in the transverse configuration.

10 21. The device of claim 20, wherein the arcuate tines are in phase with one another such that the spiral about the central axis in the planar configuration.

22. The device of claim 21, wherein the arcuate tines have  
15 an arcuate length that is greater than a radius of the body.

23. A method for closing an opening in a wall of a body lumen, comprising:

advancing a distal end of an elongate member through a  
20 patient's skin along a passage through tissue and into the body lumen;

positioning a distal portion of an obturator distally beyond the distal end of the elongate member along the passage within the body lumen;

expanding one or more expandable elements on the distal  
5 portion of the obturator transversely;

withdrawing the obturator from the passage until the expandable elements contact the wall of the body lumen, thereby providing a tactile indication of a location of the wall of the body lumen between the elongate member and the plurality of  
10 expandable elements of the obturator;

advancing a clip into the passage over the elongate member until tines of the clip penetrate the wall of the body lumen, the tines and the expandable elements on the obturator being angularly offset from one another such that the tines penetrate  
15 the wall at locations between expandable elements; and

withdrawing the elongate member from the body lumen and passage, leaving the clip to substantially close the opening in the wall of the body lumen.

20 24. The method of claim 23, wherein when the elongate member is withdrawn, the tines automatically at least partially move towards a planar configuration to substantially close the opening.



25. The method of claim 23, further comprising providing a carrier assembly on the elongate member, the carrier assembly carrying the clip.

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26. The method of claim 23, wherein the tines comprise primary tines and secondary tines, and wherein advancing the clip comprises:

puncturing the wall of the body lumen with the primary tines  
10 until tips of the primary tines enter the body lumen; and

puncturing the wall of the body lumen with the secondary  
tines;

wherein the primary tines and the secondary tines puncture  
the walls without contacting the expandable elements of the  
15 obturator.

27. A method for manufacturing a clip, comprising:

providing a sheet of material defining a plane;

removing one or more portions from the sheet to provide a  
20 clip comprising a generally-annular body including a plurality of  
looped elements defining a periphery, and a plurality of tines  
extending from the body within the plane; and

deforming the clip to a transverse configuration, wherein  
the tines extend out of the plane.

28. The method of claim 27, wherein the sheet comprises a  
5 nickel-titanium alloy.

29. The method of claim 27, further comprising coating at  
least a portion of the clip with a therapeutic coating.

10 30. The method of claim 27, further comprising creating a  
radiopaque marker on at least a portion of the clip.

31. The method of claim 27, wherein deforming of the clip  
to the transverse configuration comprises loading the clip onto a  
15 delivery apparatus.

32. The method of claim 27, further comprising heat  
treating the clip with the tines extending within the plane to  
program a shape memory of the sheet of material before deforming  
20 of the clip to the transverse configuration.

33. The method of claim 27, further comprising compressing the looped elements to a compressed state to reduce a periphery of the clip.

5        34. The method of claim 27, wherein the looped elements are compressed when the clip is deformed to the transverse configuration.

35. The method of claim 27, further comprising coating at  
10    least a portion of the clip with a hydrophilic polymer.